

## CLAIMS

1. A fuel cell formed by stacking an electrolyte electrode assembly (12) and separators (13) alternately, said electrolyte electrode assembly (12) including an anode (28) and a cathode (30) and an electrolyte (26) interposed between said anode (28) and said cathode (30),

wherein a fuel gas supply passage (24a), an oxygen-containing gas supply passage (20a), a coolant supply passage (22a), a fuel gas discharge passage (24b), an oxygen-containing gas discharge passage (20b), and a coolant discharge passage (22b) extend through said fuel cell in a stacking direction of said fuel cell;

said separator (13) at least includes first and second plates (14, 16) stacked together;

said first metal plate (14) has an oxygen-containing gas flow field (32) including a curved flow passage for supplying an oxygen-containing gas along said cathode (30), and said second metal plate (16) has a fuel gas flow field (96) including a curved flow passage for supplying a fuel gas along said anode (28); and

a coolant flow field (42) including two or more inlet buffers (44, 46) connected to said coolant supply passage (22a), two or more outlet buffers (48, 50) connected to said coolant discharge passage (22b), and straight flow grooves (60) connected between said inlet buffers (44, 46) and said outlet buffers (48, 50) is provided between said first and

second metal plates (14, 16).

2. A fuel cell according to claim 1, wherein a first inlet buffer (44) connected to said coolant supply passage (22a) and a first outlet buffer (50) connected to said coolant discharge passage (22b) are formed on said first metal plate (14); and

a second inlet buffer (46) connected to said coolant supply passage (22a) and a second outlet buffer (48) connected to said coolant discharge passage (22b) are formed on said second metal plate (16) at positions different from positions of said first inlet buffer (44) and said first outlet buffer (50).

3. A fuel cell according to claim 1, wherein said fuel gas flow field (96) includes an inlet buffer (98) connected to said fuel gas supply passage (24a), an outlet buffer (100) connected to said fuel gas discharge passage (24b), and a curved flow groove (102a) extending along said second metal plate (16) and connected between said inlet buffer (98) and said outlet buffer (100); and

said fuel gas flow field (96) includes an inlet buffer (34) connected to said oxygen-containing gas supply passage (20a), an outlet buffer (36) connected to said oxygen-containing gas discharge passage (20b), and a curved flow groove (38a) extending along said first metal plate (14), and connected between said inlet buffer (34) and said outlet

buffer (36).

4. A fuel cell according to claim 1, wherein each of said fuel gas flow field (96) and said oxygen-containing gas flow field (32) includes a serpentine flow passage.

5. A fuel cell according to claim 4, wherein the number of grooves in said serpentine flow passage decreases, and then, increases.

6. A fuel cell according to claim 1, wherein each of said fuel gas flow field (125) and said oxygen-containing gas flow field (118) includes a substantially U-shaped flow passage.

7. A fuel cell according to claim 1, wherein each of said first and second metal plates (14, 16) has a horizontally long rectangular shape, and stacked in a horizontal direction.

8. A fuel cell according to claim 7, wherein among six passages comprising said fuel gas supply passage (24a), said oxygen-containing gas supply passage (20a), said coolant supply passage (22a), said fuel gas discharge passage (24b), said oxygen-containing gas discharge passage (20b), and said coolant discharge passage (22b), three passages extend through a left end of said first and second metal plates

(14, 16), and the other three passages extend through a right end of said first and second metal plates (14, 16).

9. A fuel cell formed by stacking an electrolyte electrode assembly (12) and separators (302) alternately, said electrolyte electrode assembly (12) including an anode (28) and a cathode (30) and an electrolyte (26) interposed between said anode (28) and said cathode (30),

wherein a reactant gas supply passage (20a), a coolant supply passage (22a), a reactant gas discharge passage (20b), and a coolant discharge passage (22b) extend through said fuel cell in a stacking direction of said fuel cell;

said separator (302) at least includes first and second metal plates (304, 306) stacked together, and a coolant flow field (42) is formed between said first and second metal plates (304, 306);

said coolant flow field (42) includes two or more inlet buffers (44, 46) connected to said coolant supply passage (22a) through inlet connection passages, two or more outlet buffers (48, 50) connected to said coolant discharge passage (22b) through outlet connection passages, and flow grooves connected between said two or more inlet buffers (44, 46) and said two or more outlet buffers (48, 50);

at least the number of grooves in a first inlet connection passage (308) connecting said first inlet buffer (44) to said coolant supply passage (22a) and the number of grooves in a second inlet connection passage (310)

connecting said second inlet buffer (46) to said coolant supply passage (22a) are different; and

at least the number of grooves in a first outlet connection passage (312) connecting said first outlet buffer (48) to said coolant discharge passage (22b) and the number of grooves in a second outlet connection passage (314) connecting said second outlet buffer (50) to said coolant discharge passage (22b) are different.

10. A fuel cell according to claim 9, wherein an oxygen-containing gas flow field (32) including a curved flow passage is formed on one surface of said first metal plate (304) for supplying an oxygen-containing gas along said cathode (30), and a fuel gas flow field (96) including a curved flow passage is formed on one surface of said second metal plate (306) for supplying a fuel gas along said anode (28); and

a first inlet buffer (44) connected to said coolant supply passage (22a) and a first outlet buffer (50) connected to said coolant discharge passage (22b) are formed on the other surface of said first metal plate (304); and

a second inlet buffer (46) connected to said coolant supply passage (22a) and a second outlet buffer (48) connected to said coolant discharge passage (22b) are formed on the other surface of said second metal plate (306) at positions different from positions of said first inlet buffer (44) and said first outlet buffer (50).

11. A fuel cell according to claim 9, wherein each of said fuel gas flow field (96) and said oxygen-containing gas flow field (32) includes a serpentine flow passage.

12. A fuel cell according to claim 9, wherein each of said first and second metal plates (304, 306) has a horizontally long rectangular shape, and stacked in a horizontal direction.

13. A fuel cell according to claim 12, wherein said reactant gas supply passage comprises a fuel gas supply passage (24a) and an oxygen-containing gas supply passage (20a), and said reactant gas discharge passage comprises a fuel gas discharge passage (24b) and an oxygen-containing gas discharge passage (20b); and

among six passages comprising said fuel gas supply passage (24a), said oxygen-containing gas supply passage (20a), said coolant supply passage (22a), said fuel gas discharge passage (24b), said oxygen-containing gas discharge passage (20b), and said coolant discharge passage (22b), three passages extend through a left end of said first and second metal plates (304, 306), and the other three passages extend through a right end of said first and second metal plates (304, 306).

14. A fuel cell formed by stacking an electrolyte

electrode assembly (12) and separators (13) alternately, said electrolyte electrode assembly (12) including an anode (28) and a cathode (30) and an electrolyte (26) interposed between said anode (28) and said cathode (30),

5            wherein a fuel gas supply passage (24a), an oxygen-containing gas supply passage (20a), a coolant supply passage (22a), a fuel gas discharge passage (24b), an oxygen-containing gas discharged passage (20b), and a coolant discharge passage (22b) extend through said fuel  
10 cell in a stacking direction of said fuel cell;

          said separator (13) at least includes first and second metal plates (14, 16) stacked together;

          said first metal plate (14) has an oxygen-containing gas flow field (32) for supplying an oxygen-containing gas  
15 along said cathode (30), said second metal plate (16) has a fuel gas flow field (96) for supplying a fuel gas along said anode (28), said oxygen-containing gas flow field (32) includes a serpentine flow passage and said fuel gas flow field (96) includes a serpentine flow passage, and the  
20 serpentine flow passage of said oxygen-containing gas flow field (32) and the serpentine flow passage of said fuel gas flow field (96) have the same number of turn regions; and

          a coolant flow field (42) including two or more inlet buffers (44, 46) connected to said coolant supply passage  
25 (22a), two or more outlet buffers (48, 50) connected to said coolant discharge passage (22b), and straight flow grooves (60) connected between said two or more inlet buffers (44,

46) and said two or more outlet buffers (48, 50) is provided between said first and second metal plates (14, 16).

15. A fuel cell according to claim 14, wherein among  
5 six passages comprising said fuel gas supply passage (24a),  
said oxygen-containing gas supply passage (20a), said  
coolant supply passage (22a), said fuel gas discharge  
passage (24b), said oxygen-containing gas discharge passage  
(20b), and said coolant discharge passage (22b), three  
10 passages extend through a left end of said first and second  
metal plates (14, 16), and the other three passages extend  
through a right end of said first and second metal plates  
(14, 16).